



University of Pennsylvania  
**ScholarlyCommons**

---

Issue Briefs

Leonard Davis Institute of Health Economics

---

10-8-2018

# The Current State of Evidence on Bundled Payments

Aaron Glickman  
*University of Pennsylvania*

Claire Dinh  
*University of Pennsylvania*

Amol Navathe  
*University of Pennsylvania*

Follow this and additional works at: [https://repository.upenn.edu/ldi\\_issuebriefs](https://repository.upenn.edu/ldi_issuebriefs)

---

Glickman, Aaron; Dinh, Claire; and Navathe, Amol. The Current State of Evidence on Bundled Payments. LDI Issue Briefs. 2018; 22 (5). <https://ldi.upenn.edu/brief/current-state-evidence-bundled-payments>

" >

<https://ldi.upenn.edu/brief/current-state-evidence-bundled-payments>

This paper is posted at ScholarlyCommons. [https://repository.upenn.edu/ldi\\_issuebriefs/124](https://repository.upenn.edu/ldi_issuebriefs/124)

For more information, please contact [repository@pobox.upenn.edu](mailto:repository@pobox.upenn.edu).

---

# The Current State of Evidence on Bundled Payments

## **Abstract**

A review of the evidence shows that bundled payments for surgical procedures can generate savings without adversely affecting patient outcomes. Less is known about the effect of bundled payments for chronic medical conditions, but early evidence suggests that cost and quality improvements may be small or non-existent. There is little evidence that bundles reduce access and equity, but continued monitoring is required.

## **Keywords**

bundled payments, value-based payment reform

## **License**



This work is licensed under a [Creative Commons Attribution-NonCommercial 4.0 License](https://creativecommons.org/licenses/by-nc/4.0/).

## THE CURRENT STATE OF EVIDENCE ON BUNDLED PAYMENTS

Aaron Glickman, Claire Dinh, and Amol S. Navathe

A review of the evidence shows that bundled payments for surgical procedures can generate savings without adversely affecting patient outcomes. Less is known about the effect of bundled payments for chronic medical conditions, but early evidence suggests that cost and quality improvements may be small or non-existent. There is little evidence that bundles reduce access and equity, but continued monitoring is required.

### INTRODUCTION

Paying physicians and health institutions using bundled payments has become increasingly popular since the passage of comprehensive health reform in 2010. Once limited to small pilot projects between individual payers and health systems, bundled payments have now become a central strategy for the Centers for Medicare and Medicaid Services (CMS) to increase quality while controlling health care costs. Bundled payment initiatives now include dozens of medical conditions and procedures in over 1,000 institutions in the U.S., covering hundreds of thousands of episodes of care annually. In this brief, we review how bundled payments have changed the cost and quality of care, as well as whether they have had any unintended impact on access and equity.

### BACKGROUND

#### THE LANDSCAPE OF BUNDLED PAYMENTS

Bundled payments are one of a series of reforms designed to move providers away from fragmented fee-for-service (FFS) structures toward payment models that shift financial risk for both total cost of care and quality on to providers. Under bundled payments, providers are responsible for the total cost of a pre-determined episode of care, including costs of labor, medical devices (e.g. implants), complications, post-acute care,

and readmissions. Care episodes can include surgical procedures, such as coronary artery bypass grafting (CABG), or medical conditions, such as acute myocardial infarction (AMI). If providers keep costs below a risk-adjusted target price, they receive a portion of the shared savings; if they exceed the target price, they incur financial penalties.

Although commercial payers also use bundles, most studies have evaluated bundled payment programs in Medicare. A brief description of the largest programs appears in Table 1. While CMS can mandate bundles on providers, most participation is voluntary. As shown, the scale and target conditions vary across bundles.

After small demonstration projects with cardiac and orthopedic procedures,<sup>1</sup> in 2013 CMS launched its largest national bundled payment program, the [Bundled Payments for Care Improvement \(BPCI\) initiative](#). Although BPCI has four models, we focus here on [Model 2](#), which is the largest program and the basis for commercial bundles.

BPCI Model 2 covers all Medicare charges for both hospitalizations and post-acute care (PAC), which includes acute inpatient care (i.e., readmissions), office or other (e.g. physical therapy) visits, outpatient facility care, or durable medical equipment. BPCI participants select the surgical procedures or medical conditions to bundle. Hip and knee replacements are the most commonly selected surgical procedures, and congestive heart

**Table 1. Overview of Bundles**

| Program                                      | Start Year | Number of Participants                          | Outpatient and/or inpatient trigger | Services Covered  | Conditions and Procedures   |
|--|------------|---|-------------------------------------|---|---|
| BPCI Model 2 (Voluntary) <sup>2</sup>        | 2013       | 253 hospitals and 152 physician group practices | Inpatient                           | Inpatient hospital and physician services, PAC, readmissions                | 48 clinical episodes (e.g. AMI, hip/knee replacements, CABG)                                |
| CJR (Mandatory) <sup>3</sup>                 | 2015       | 67 MSAs*  | Inpatient                           | Inpatient and outpatient hospital and physician services, PAC, readmissions | Hip/knee replacements   |
| Oncology Care Model (Voluntary) <sup>5</sup> | 2016       | 178 practices, 13 payers                        | Outpatient                          | All Medicare Parts A, B, and certain Part D expenditures                    | Cancers not treated with surgery, radiation, or topical chemotherapy                        |
| BPCI Advanced (Voluntary) <sup>4</sup>       | 2018       | TBD   | Both                                | Inpatient and outpatient hospital and physician services, PAC, readmissions | 29 inpatient clinical episodes (e.g. AMI) and three outpatient clinical episodes (e.g. PCI) |

\*Reduced to 34 mandated MSAs in 2018, though hospitals in the remaining 33 MSAs may volunteer to continue participation.

failure (CHF) is the most popular medical condition. Medicare continues to pay on a FFS basis, but the cost is reconciled after the episode closes. Currently, more than 400 providers participate in BPCI Model 2.<sup>2</sup>

Medicare’s [Comprehensive Care for Joint Replacement \(CJR\)](#) model is a mandatory program for hip and knee replacements. Like BPCI, hospitals in CJR are responsible for all Medicare spending for inpatient and 90 days post-discharge. Providers are still paid on a FFS basis, but differences between target prices and incurred costs are reconciled at the end of the year. While individual hospitals volunteer to participate in BPCI, CJR participation occurs at the market level. CJR is currently underway in 67 metropolitan statistical areas (MSAs), many of which CMS picked because they are high-spending regions. For the first two years (2016-2017), about 800 hospitals were required to participate. CMS shrunk the program in 2018, mandating participation in 34 MSAs and including 465 hospitals.<sup>3</sup>

The recently launched [BPCI Advanced](#) extends bundled payments to the outpatient setting. In addition to covering 29 inpatient episodes, BPCI Advanced includes three outpatient episodes, such as percutaneous coronary intervention (PCI), also known as angioplasty with stent. Participation in BPCI Advanced will count as an advanced payment model under the new Medicare Access and CHIP Reauthorization Act (MACRA), which entitles providers to a 5% bonus Medicare payment and exempts providers from several reporting requirements.<sup>4</sup>

## BUNDLED PAYMENTS, COST, AND QUALITY

The most pressing concern regarding bundled payments is whether or not they reduce the cost of care while preserving or improving patient outcomes. Do bundled payments reduce the average per-episode cost, and if so, how are hospitals achieving these savings?

## COSTS AND QUALITY FOR SURGICAL PROCEDURES: BPCI

[Dummit and colleagues](#) (2016) used Medicare claims data and patient surveys to study how BPCI participation influenced cost and quality for hip and knee replacements. They found that BPCI hospitals achieved average per-episode savings of \$1,166 (4%) over similar non-participating hospitals. The largest savings were in post-acute care, particularly skilled nursing facilities (SNFs) and inpatient rehabilitation facilities (IRFs). They found no differences in 30- and 90-day mortality and readmissions rates between BPCI and non-BPCI hospitals. Patient-reported outcomes (e.g. satisfaction, improvement in activities, and pain) remained either unchanged or modestly improved in the BPCI group.<sup>6</sup>

In a study of a 5-hospital integrated system, [Navathe and colleagues](#) (2017) demonstrated the ability for bundled payments to lead to even larger savings at top performing hospitals and provided more detail on how hospitals responded to bundled payments for hip and knee replacements. They found that average per-episode payments decreased by 21% from 2008 to 2015, with statistically significant decreases only during BPCI participation. In line with Dummit’s findings, the study found no effect on readmissions or emergency department visits.

How did the hospital system achieve these savings? Using the health system’s internal cost data, the authors found that PAC accounted for 49% of savings, with 51% achieved through reductions in internal hospital costs (implants, blood supply, and room and board). Reductions of internal hospital costs did not result in savings to Medicare, which pays these expenses on a prospective system. The finding is striking because hospitals already have an incentive to reduce

internal costs under the prospective system, which suggests that the financial incentives under BPCI (i.e. gainsharing) were especially powerful in motivating surgeons to standardize implant use and hospital costs through alignment with the hospital.<sup>7</sup>

[Liao and colleagues](#) (2018) explored whether bundled payments reduced the variation in practice from 2009 to 2015 among 34 surgeons in the same 5-hospital system. The study found modest (though not statistically significant) decreases in variation in implant cost per case and institutional PAC use, while variation across surgeons in total episode payment increased. The findings suggest that while reduction in practice variation can occur under bundles, it is not absolutely necessary to achieve savings.

[Zhu and colleagues](#) (2018) added perspective on how hospitals reacted to bundled payments and achieved PAC savings. In a series of semi-structured interviews with hospital executives, the authors found that the primary hospital strategies for succeeding under bundle payments included reducing SNF referrals, leveraging home care supports, and enhancing coordination with pre-determined networks of SNFs—such as electronic health record integration and hiring care coordinators.<sup>8</sup>

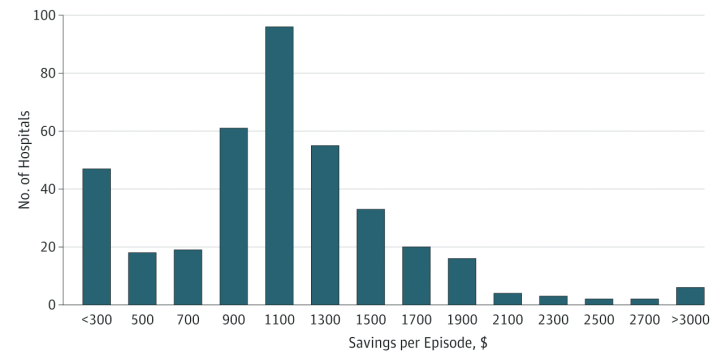
### COST AND QUALITY FOR SURGICAL PROCEDURES: CJR

Because CJR is relatively new, its effect on cost, quality, and access is less understood. In an analysis of CJR's first year, [Finkelstein and colleagues](#) (2018) found that the average percentage of hip and knee replacement admissions discharged to institutional PAC was 33.7% in non-CJR hospitals and 30.8% among CJR hospitals. The overall reduction in per-episode spending was much more modest than observed in BPCI. Total Medicare spending was \$453 lower at CJR hospitals before accounting for shared savings distributions, which eliminated the difference.<sup>9</sup>

[Navathe and colleagues](#) (2018) compared hospitals that achieved savings with hospitals that did not under CJR. Just under half (48%) of hospitals produced savings. In each market, the average savings per episode ranged from \$14 to \$3,591, and the proportion of hospitals saving money in a given market ranged from 0% to 100%.<sup>10</sup>

Compared to non-saving hospitals, hospitals that reduced average cost were larger, had a higher volume of procedures, were more likely to be non-profit or teaching hospitals, and were also more likely to be integrated with PAC facilities. Further, hospitals achieving savings did not start with higher baseline episode spending, debunking a belief previously held by some experts.

**Figure 1. Distribution of Savings in CJR**



Navathe AS, Liao JM, Shah Y, et al. Characteristics of Hospitals Earning Savings in the First Year of Mandatory Bundled Payment for Hip and Knee Surgery. *JAMA*. 2018;319(9):930-932.

### COST AND QUALITY FOR MEDICAL CONDITIONS

Less is known about the effect of bundled payments on chronic medical conditions, but early evidence suggests that cost and quality improvements may be small or non-existent. [Maddox and colleagues](#) (2018) used Medicare claims data from 2013 to 2015 to assess cost and quality for five commonly selected BPCI conditions—congestive heart failure, pneumonia, chronic obstructive pulmonary disease (COPD), sepsis, and acute myocardial infarction—over an average of 7 months of BPCI participation. Average per-episode spending across all five conditions decreased in BPCI and non-BPCI hospitals by \$286 and \$398, respectively, but the differential decrease was not statistically significant. There were no observed differences in readmission rates, mortality, or other quality measures.<sup>11</sup>

Why might bundled payments have different effects for procedures and medical conditions? It could be a [timing issue](#): while hospitalizations are an excellent trigger for surgical bundles, inpatient admissions do not always indicate the beginning of a medical condition. It also could take more time to redesign care for medical conditions, or be due to factors involving PAC. For example, while PAC spending can be standardized and yield savings more easily for surgical conditions, medical conditions have more cyclical spending patterns between inpatient and PAC services. Moreover, the types of services provided in PAC settings differ substantially between surgical procedures and medical conditions; reducing PAC utilization without negatively affecting quality may be more difficult when treating medical conditions than after surgical procedures.<sup>12</sup>

## BUNDLED PAYMENTS AND UNINTENDED CONSEQUENCES

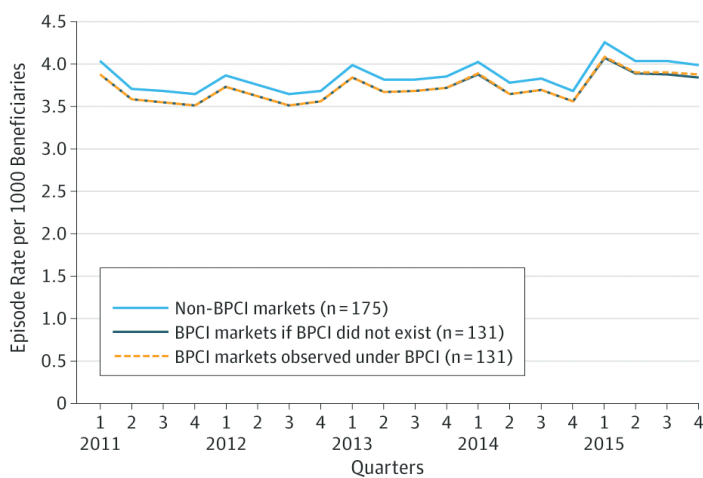
### DO HOSPITALS PERFORM MORE PROCEDURES?

In the case of bundles, one prominent concern is that while average per-episode spending may decrease, episode-based payments could drive greater volume that, in turn, offsets savings to Medicare. Episodic Medicare savings [could be eliminated](#) if hospitals perform more hip and knee replacements than they otherwise would have,<sup>13</sup> and early studies of BPCI found modest increases in [procedure volume](#).<sup>7</sup>

However, volume increases may not necessarily be an undesired outcome. If bundled payments raise quality (e.g., reduce complications), then the value of joint replacement may improve, increasing the number of patients who could benefit from the procedure. If providers shift patients from non-BPCI facilities to BPCI facilities, it would increase market share for BPCI participants without changing overall procedural volume. In both cases, more volume would be a [sign of success](#) rather than an unintended consequence.<sup>14</sup>

[Navathe and colleagues](#) (2018) evaluated hip and knee replacement volume at the market level under BPCI. They found volume increases in both BPCI and non-BPCI markets between 2011 and 2015, but no significant differences due to BPCI participation. The results suggest that increased volume at BPCI hospitals is likely a result of growing market share, not overall volume spikes.<sup>15</sup>

**Figure 2. Volume of Hip and Knee Replacement Under Bundled Payments**



Navathe AS, Liao JM, Dykstra SE, et al. Association of Hospital Participation in a Medicare Bundled Payment Program With Volume and Case Mix of Lower Extremity Joint Replacement Episodes. *JAMA*. 2018;320(9):901-910.

### DO HOSPITALS AVOID HIGHER-RISK PATIENTS?

Because bundled payments tie provider compensation to quality outcomes and overall spending, there is a concern that providers may improve their performance measures by avoiding high-risk patients. Such risk-selection could reduce access to care based on health, demographic, and socioeconomic factors. While early studies of bundled payments for surgical procedures found no evidence of patient selection, and target prices are adjusted partly based on patient risk, hospitals have informational advantages over Medicare that may allow discrimination.

To study the effect of BPCI participation on patient selection for hip and knee replacements, [Navathe and colleagues](#) (2018) compared 20 patient characteristics, including comorbidities, demographics, socioeconomic, and prior utilization, at 265 matched BPCI and non-BPCI hospitals. The authors largely found no significant differences across any relevant case-mix measures, which suggests that bundled payments did not significantly affect health disparities.<sup>15</sup> However, patients at BPCI hospitals were less likely to have been admitted to a SNF in the prior 12 months, leading to a concern that hospitals may be avoiding patients with a history of institutional care. On the other hand, it may be the case that SNF admission is associated with other clinical factors that make joint replacement a less effective option for such patients. The appropriateness of this change was not assessed in their study.

## DIFFERENCES BETWEEN HOSPITALS IN BPCI AND CJR

### THE NEED FOR BOTH

Going forward, there is a question of whether future bundled payments have to be mandatory. If hospitals that choose to participate differ from those that must participate, then both voluntary and mandatory bundles are needed to engage providers. But if voluntary and mandatory participants are similar, then mandatory bundles may be unnecessary.

[Navathe and colleagues](#) (2018) analyzed data from Medicare and the American Hospital Association to compare characteristics and baseline performance between BPCI and CJR hospitals. The study found that CJR and BPCI hospitals were similar in terms of baseline cost and quality, but they differed in other characteristics: BPCI hospitals were more likely to be non-profit and teaching intensive than CJR hospitals. BPCI hospitals were larger and had higher patient volume. The findings suggest that both mandatory and voluntary programs may be required to engage a broad cross-section of hospitals and markets, and results in one payment model may not be applicable to other programs.<sup>16</sup> Furthermore, the 67 markets currently in CJR are not representative of the rest of the nation—as demonstrated by Liao and colleagues in a forthcoming study.<sup>17</sup>

## CONCLUSION

### THE FUTURE OF EPISODE-BASED PAYMENT

The evidence to date suggests that bundled payments yield favorable results for surgical conditions such as hip and knee replacement, which have predictable cycles of spending and defined quality metrics. However, bundled payments for medical conditions have yet to achieve savings or improve quality. While the potential unintended consequences of bundles have not yet been observed, researchers will continue to monitor bundled payment implementation going forward.

Another round of bundled payment evaluation is on the horizon as well. The recently launched BPCI Advanced program will provide a wealth of new data as Medicare and commercial insurers use bundles for more procedures, conditions, and settings—including outpatient clinics. As the program develops, researchers will begin to assess how episodic payments can bring high value care to a greater number of patients and provide iterative feedback on model design.

As policymakers and payers consider the next generation of bundled payment models, aligning design with intended outcomes and other payment models may be the key to maximizing value. The diversity of bundled payment programs and evidence to date reveal that the path to high value care via episode-base payment requires constant innovation and evaluation. As the widespread cultural shift from volume to value in health care accelerates, bundled payments will only grow in relevance.

## REFERENCES

1. Medicare Acute Care Episode (ACE) Demonstration. <https://innovation.cms.gov/initiatives/ACE>.
2. BPCI Model 2: Retrospective Acute & Post Acute Care Episode. 2018; <https://innovation.cms.gov/initiatives/BPCI-Model-2/>. Accessed October 3, 2018.
3. Comprehensive Care for Joint Replacement Model. <https://innovation.cms.gov/initiatives/cjr>. Accessed October 3 2018.
4. BPCI Advanced. <https://innovation.cms.gov/initiatives/bpci-advanced>.
5. Oncology Care Model. <https://innovation.cms.gov/initiatives/oncology-care/>. Accessed October 3 2018.
6. Dummit LA, Kahvecioglu D, Marrufo G, et al. Association Between Hospital Participation in a Medicare Bundled Payment Initiative and Payments and Quality Outcomes for Lower Extremity Joint Replacement Episodes. *JAMA*. 2016;316(12):1267-1278.
7. Navathe AS, Troxel AB, Liao JM, et al. Cost of Joint Replacement Using Bundled Payment Models. *JAMA Intern Med*. 2017;177(2):214-222.
8. Zhu JM, Patel V, Shea JA, Neuman MD, Werner RM. Hospitals Using Bundled Payment Report Reducing Skilled Nursing Facility Use And Improving Care Integration. *Health Aff (Millwood)*. 2018;37(8):1282-1289.
9. Finkelstein A, Ji Y, Mahoney N, Skinner J. Mandatory Medicare Bundled Payment Program for Lower Extremity Joint Replacement and Discharge to Institutional Postacute Care: Interim Analysis of the First Year of a 5-Year Randomized Trial. *JAMA*. 2018;320(9):892-900.
10. Navathe AS, Liao JM, Shah Y, et al. Characteristics of Hospitals Earning Savings in the First Year of Mandatory Bundled Payment for Hip and Knee Surgery. *JAMA*. 2018;319(9):930-932.
11. Joynt Maddox KE, Orav EJ, Zheng J, Epstein AM. Evaluation of Medicare's Bundled Payments Initiative for Medical Conditions. *N Engl J Med*. 2018;379(3):260-269.
12. Amol S. Navathe ES, Joshua M. Liao. What Have We Learned About Bundling Medical Conditions? *Health Affairs Blog*. Accessed October 3, 2018.
13. Mechanic RE. Opportunities and challenges for episode-based payment. *N Engl J Med*. 2011;365(9):777-779.
14. Navathe AS, Liao JM, Emanuel EJ. Volume Increases and Shared Decision-making in Joint Replacement Bundles. *Ann Surg*. 2018;267(1):35-36.
15. Navathe AS, Liao JM, Dykstra SE, et al. Association of Hospital Participation in a Medicare Bundled Payment Program With Volume and Case Mix of Lower Extremity Joint Replacement Episodes. *JAMA*. 2018;320(9):901-910.
16. Navathe AS, Liao JM, Polsky D, et al. Comparison Of Hospitals Participating In Medicare's Voluntary And Mandatory Orthopedic Bundle Programs. *Health Aff (Millwood)*. 2018;37(6):854-863.
17. Liao JM EE, Polsky DE, Huang Q, Shah Y, Zhu J, Lyon ZM, Dykstra SE, Dinh C, Cousins D, Navathe AS. National representativeness of hospitals and markets in Medicare's mandatory bundled payment programs. *Health Aff (Millwood)*. In press 2018.

## ABOUT LDI

Since 1967, the Leonard Davis Institute of Health Economics at the University of Pennsylvania (Penn LDI) has been the leading university institute dedicated to data-driven, policy-focused research that improves our nation's health and health care. Originally founded to bridge the gap between scholars in business (Wharton) and medicine, Penn LDI now connects all of Penn's schools and the Children's Hospital of Philadelphia through its more than 280 Senior Fellows.

*LDI Issue Briefs are produced by LDI's policy team. For more information please contact Janet Weiner at [weinerja@pennmedicine.upenn.edu](mailto:weinerja@pennmedicine.upenn.edu)*

COLONIAL PENN CENTER  
3641 LOCUST WALK  
PHILADELPHIA, PA 19104-6218  
[LDI.UPENN.EDU](http://LDI.UPENN.EDU)

P: 215-898-5611

F: 215-898-0229

🐦 @PENNLDI

## AUTHORS

**Aaron Glickman, BA**  
Policy Analyst,  
Department of Medical Ethics  
and Health Policy and  
Leonard Davis Institute of Health Economics,  
University of Pennsylvania

**Claire Dinh, BA**  
Senior Research Coordinator,  
Department of Medical Ethics  
and Health Policy,  
University of Pennsylvania

**Amol S. Navathe, MD, PhD**  
Co-Director,  
Health Care Transformation Institute  
Associate Director,  
Center for Health Incentives and  
Behavioral Economics  
Senior Fellow,  
Leonard Davis Institute for Health Economics,  
University of Pennsylvania